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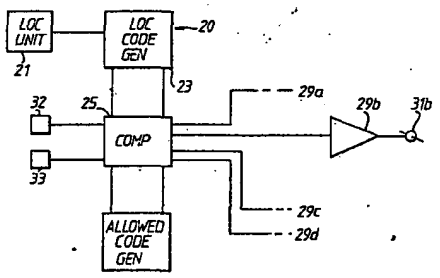
(54) Use of location-determining systems.

(57) A security system uses a navigation system, which may be radio-based, dead-reckoning or a combination of the two, to monitor the location of a vehicle or container so as to signal that it has deviated from a predetermined route and/or to control operation of a physical locking or unlocking device so as, for example, to enable a container or compartment only to be opened at a predetermined location. Thus the invention is applicable inter alia to cash-in-transit systems, to prevent secure compartments being opened except at prescribed drop-point and also to floating vessels to restrict locations at which they can discharge material.

Fig.2.



EP 0 332 434 A2

Description

USE OF LOCATION-DETERMINING SYSTEMS

The present invention relates to novel uses of navigation systems, more particularly to a security system which makes use of the facilities provided by a location-determining system.

Considering, for example, vehicles used by cash-in-transit and similar services, much effort has been expended in the design and operation of the vehicles to ensure their physical security. However, a weakness of existing designs is that access to the interior of the vehicle, or to secure compartments within it is, controlled by one or more members of the crew of the vehicle. This obviously makes the vehicle contents vulnerable in circumstances where the crew are subject to physical violence or intimidation.

It would be desirable therefore if such access could be put beyond the control of the crew as amongst other things it would be pointless for anyone attacking the vehicle to attempt to force or coerce them to cooperate.

Broadly the present invention provides a system which makes use of a navigation unit automatically to inhibit or to enable an event, or sequence of events, only when the units is at one or more specified locations. Put another way, the invention makes use of a location-determining system to determine whether a particular action, or unspecified number of actions, is permissible or not.

Thus, inter alia, the invention provides a security system comprising a location-determining unit for determining the location of the system, means for producing from the determined location a location code, means for comparing the location code with one or more permissible, neutral or prohibited locations or ranges of locations and means for signalling a security condition in accordance with the result of that comparison.

The invention also provides, in a second aspect, a security system comprising a location-determining unit, a physical locking or unlocking device and means, responsive to an output of the location-determining unit, to control operation of that device in dependence upon the location determined by the location-determining unit.

As will become apparent from the following description both aspects of the invention may be embodied in the same system.

The system may, for example, in whole or in part, be carried or installed in a vehicle used by a company for cash-in-transit purposes. The location-determining unit may be designed for use with radio-borne location signals produced by systems such as the DataTrack, Decca and LORAN-C location-determining systems, with satellite navigation systems and/or with dead reckoning systems. Such systems are currently capable of providing a positional resolution of down to less than fifty meters. The position comparison may be carried out at the location of the location-determining unit or remotely (e.g. at a base station with which it communicates e.g. by radio or cellular telephone). The security condition signal can be used for a variety of purposes. In the case of a CIT system, for example, the vehicle could be provided with one or more secure compartments to which access is controlled by an electromechanical lock. Then, the security condition signal can be used to inhibit and enable the operation of the lock depending on whether the location-determining unit reports, for example, that the vehicle is in an allowed location for a cash-drop. The system can be arranged to control access to any number of compartments in that way so that each can only be opened when the vehicle is at the location of the drop-point specified for the contents of that compartment.

The system can be arranged to disable the lock or other mechanism when the location-determining unit enters an area where it cannot operate correctly - as may occur, for example, where the vehicle passes through a tunnel.

Apart from CIT systems, the invention can be used in a wide variety of applications, of which some will be mentioned below.

The invention will be further described by way of non-limitative example with reference to the accompanying drawings, in which:-

Figure 1 is a somewhat schematic view of a CIT vehicle to which the present invention may be applied; and

Figure 2 shows in block form, the principal parts of the circuitry of the security system used in the vehicle of Figure 1.

Figure 1 shows a cash-in-transit armoured vehicle 1 having a driver cabin 3 and a secure compartment 5 with a door 7 in which one or more members of the vehicle crew travel. At a cash drop, a crew member in the compartment 5 can pass a cash bag through an access hatch 9 designed to prevent forced access from the exterior of the vehicle.

Within the compartment 5 are provided one or more locked sub-compartments 11a-d which may be used to store respective cash-bags for individual cash drops; four are illustrated but there may be any number. These are locked by electromechanical locks 13a-d which operate under control of a system 20 in accordance with the invention, which only opens any particular one (or permits that one to be opened) when it detects that the vehicle is at the intended drop-point for that sub-compartment's contents.

The system 20 comprises a location-determining unit 21, which may be a commercially available type for use with the DataTrack location-determining system and produces an output signal indicating its current location. This signal is applied to a location code generator 23 which produces a location code made up of a sequence of binary digits (say, 32) in accordance with a secure algorithm which may be periodically changed (e.g. every few days or hours). This code is compared by a comparator 25 with one or more codes held in a memory 27 which contains the permissible codes for each of the sub-compartments 11a-d. These codes may be downloaded by

radio from a base-station and be updated at the same time the base station changes the location-code generating algorithm; they may be transmitted and stored in coded or unencoded form. If a match is found, then the comparator 27 delivers an enable signal to the appropriate one of driver circuits 29a-d which then energises an associated electromechanical actuator 31a-d, which may be an electric motor, to unlock the sub-compartment 11 in question. The system may further automatically signal to the base station the fact that the lock has been operated. Further, the system may be set up so that the lock is only unlock for a predetermined period of time (and then relock it) or to relock it in any event as soon as the detected location of the system alters, so as to hamper any attempt to hijack the vehicle at a valid drop point and drive it elsewhere for unloading.

It will be appreciated that the location code generator 23 and comparator 25 may be implemented by means of a suitable programmed microprocessor.

The unlocking (or locking, if appropriate) procedure may be requested by an operator button 32, which may be located on the unit 20 inside the compartment 5, or elsewhere.

Where the locks are always intended to be opened at the same location, the appropriate location codes can be stored.

Further, the radio-based location-determining system may be supplemented or replaced by an alternative location-determining system such as a dead-reckoning system operative to compute the vehicle's position from its speed and direction; used as an adjunct to a radio-based system, a dead-reckoning system can be used to keep the system functional when it is of range of the radio-based system or reception is inadequate. Obviously, even without an additional dead reckoning system, the system can be designed to be fail-safe simply by inhibiting operation of the unlocking mechanism when the radio-based location-determining unit is inoperative; adding a dead reckoning system enables it to unlock the required lock at the appropriate location even when the radio-based unit is inoperative.

Other applications of the present invention include:-

A valve or lock for controlling the discharge of material carried by a ship, barge or other floating vessel can be controlled by a system according to the invention, implemented as described above. This could be used for only allowing the discharge of the vessel's load (or fuel).

The movement of goods in sealed containers can be remotely controlled from the point of origin, or a central control office. By use of the present system, the sealing mechanisms of such containers could be arranged to remain automatically sealed at all locations except the correct, prerecorded destination. On arrival a radio signal can be initiated by the system to advise the central control office of its arrival, so that suitable arrangements could be made for the handing over of its contents into the recipient's custody.

The system of the present invention can be applied to prevent the movement of a container of any kind (for people or goods) outside pre-ordained limits. The driver of an armoured vehicle carrying a protected load from location A to location B could be instructed to follow a specific route. Any deviation from that route could be arranged to cause an immediate alarm. Further, the system can be arranged to provide a facility whereby the unlocking (or locking procedure) can be overridden, for example by operation of a button 33 in the driver cabin, by the driver of a vehicle, if, say, the vehicle is under attack or if another operative outside the vehicle is being forced to cooperate with an attempt to steal from the vehicle. The system may require that a machine readable identity card be placed in a slot on the outside of the secure compartment and be verified before the unlocking procedure takes place; this can be arranged to be in view of the driver or another occupant of the driver cabin 3 and subject to the override just mentioned in case an attempt to use the card is made under duress or by a person not authorised. The use of such a card is not of course limited to CIT and similar vehicles but may equally well be adopted in the various other embodiments of the invention.

Claims

1. A security system comprising a location-determining unit, a physical locking or unlocking device and means, responsive to an output of the location-determining unit, to control operation of that device in dependence upon the location determined by the location-determining unit.

2. A system according to claim 1, in which the means comprise a location-code generator for producing a code corresponding to the location determined by the location-determining unit, a memory for storing one or more permissible location codes and a comparator for comparing the location code with the permissible code or codes to control operation of the device.

3. A system according to claim 2, in which the location-code generator is operative to produce the location code in accordance with a secure algorithm.

4. A system according to claim 2 or 3 and including means for overriding the detection of a location code corresponding to a permissible code to inhibit operation of the device.

5. A system according to any one of claims 1 to 4 and including means for signalling that the device has been operated.

6. A system according to any one of claims 1 to 5 in which there are a number of such devices controlled by the control means, each having respective permissible location codes for enabling operation of that device.

7. A system according to any one of claims 1 to 6 in which the, or each, device is a lock controlling access to a secure compartment.

8. A system according to any one of claims 1 to 7 in which means are provided to unlock the

device for a predetermined period of time following detection of a permissible location and/to relock the device when the detected location changes.

9. A vehicle comprising a system according to any one of claims 1 to 8 and at least one secure compartment to which access is controlled by that system.

10. A vehicle according to claim 9, in which the system is in accordance with claim 4 and the overriding means is operable from within a cabin of the vehicle.

11. A floating vessel comprising a system according to any one of claims 1 to 3 and a valve or lock for controlling discharge of material from the vessel, operation of the valve or lock being controlled by the system in dependence upon the detected location.

12. A security system comprising a navigation unit for determining the location of the system, means for producing from the determined location a location code, means for comparing the location code with one or more permissible, neutral or prohibited locations or ranges of locations and means for signalling a security condition in accordance with the result of that comparison.

13. A system according to claim 12, wherein the signalling means is operative to signal deviation of the detected location from a defined route or to control operation of a physical locking or unlocking device if a permissible location is detected.

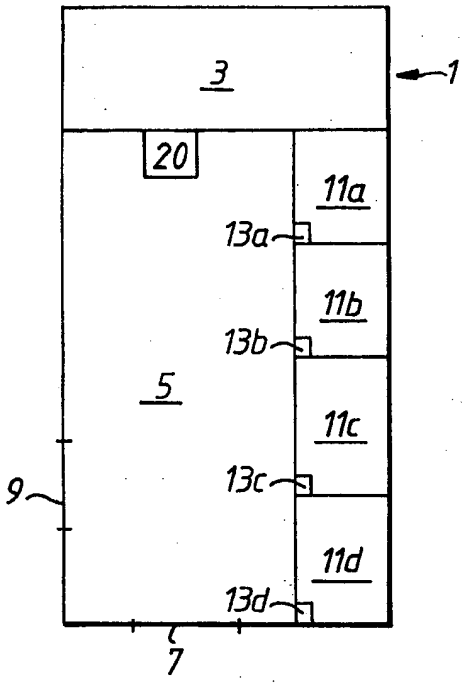
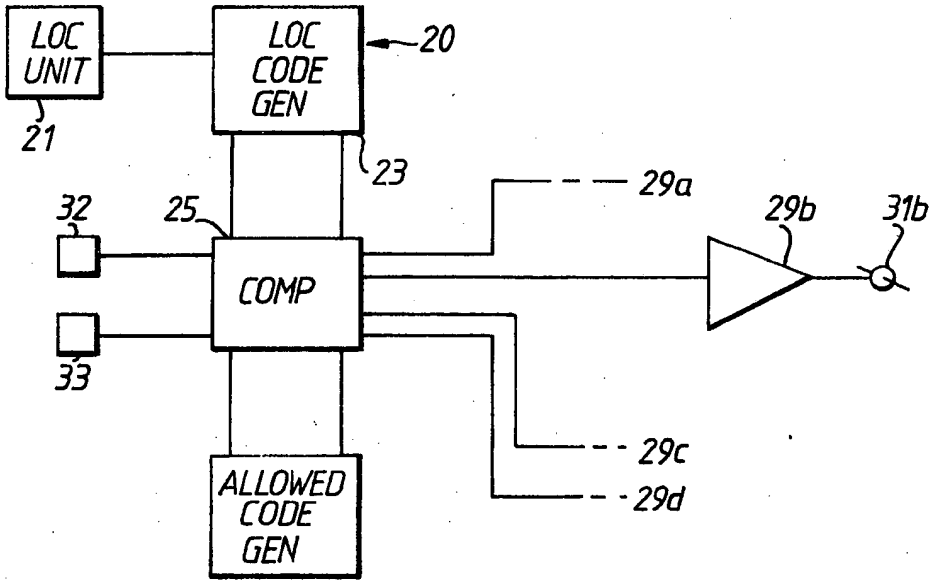

3
1
20
11a
13a
11b
13b
5
11c
13c
9
11d
13d
7

Fig .1.

Fig .2.


LOC UNIT
21
LOC CODE GEN
20
23
32
25
COMP
33
29a
29b
31b
29c
29d
ALLOWED CODE GEN